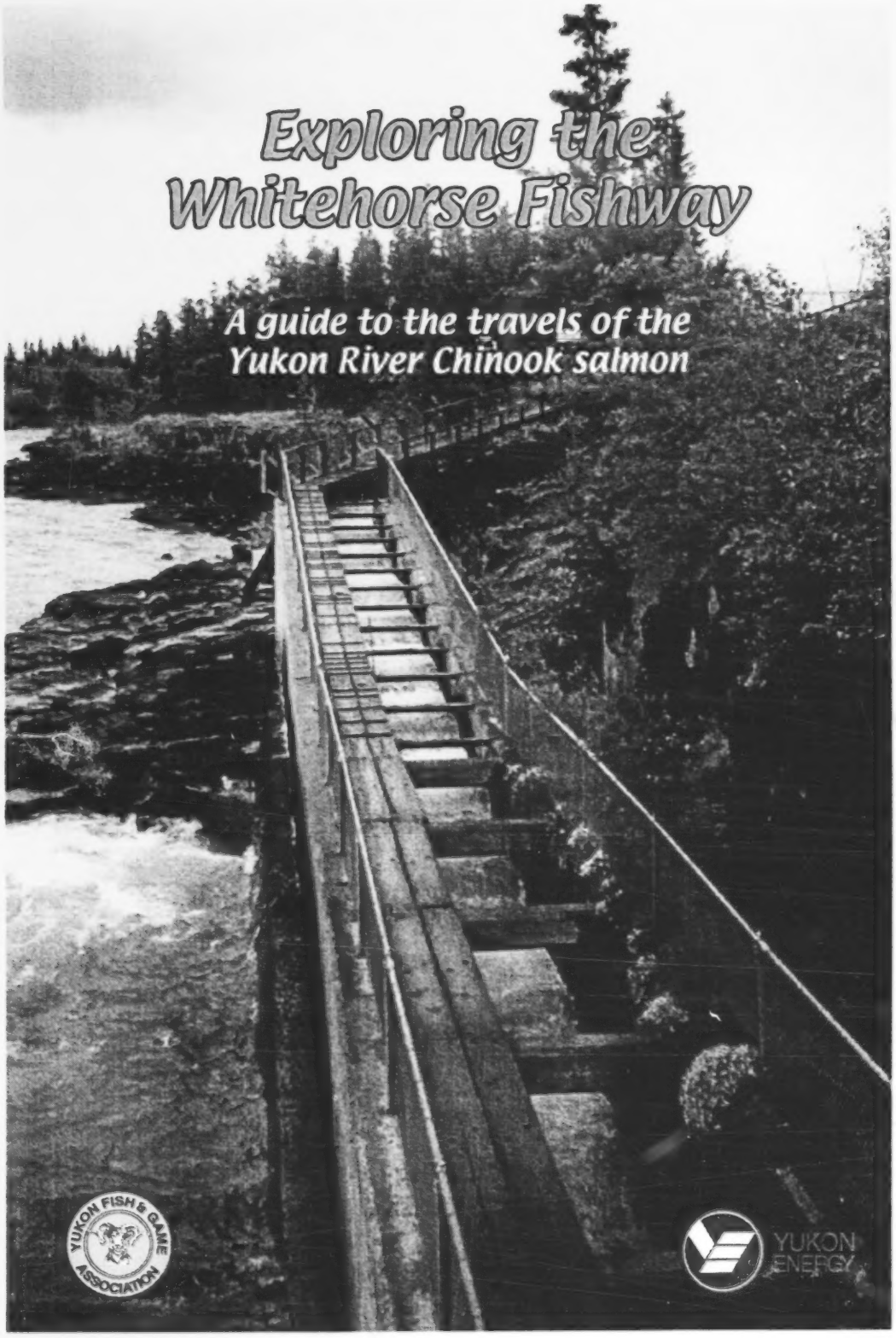
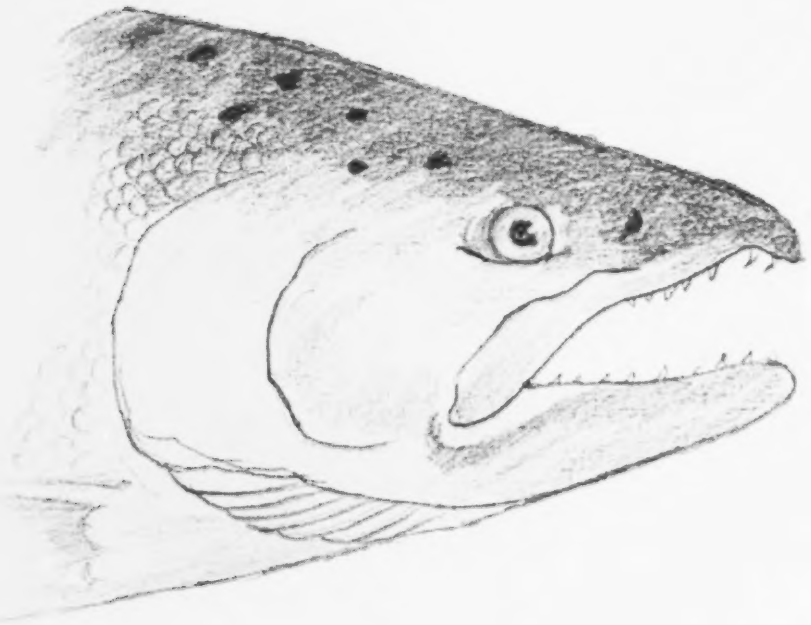

Exploring the Whitehorse Fishway
A guide to the travels of the Yukon River Chinook salmon
YUKON FISH & GAME ASSOCIATION
YUKON ENERGY



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Back cover photo, Government of the Yukon

This guide to the Whitehorse Fishway is provided by the Yukon Energy Corporation as a community service. Any suggestions you have for inclusion in future printings are encouraged.

One in a series of local guides. Also available: *Enjoying Whitehorse Trails* and *Viewing Whitehorse from above: A guide to Haeckel Hill • Thay T'äw.*

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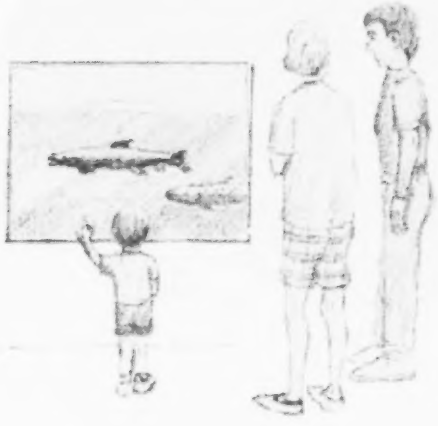
Of fish and the Whitehorse Fishway

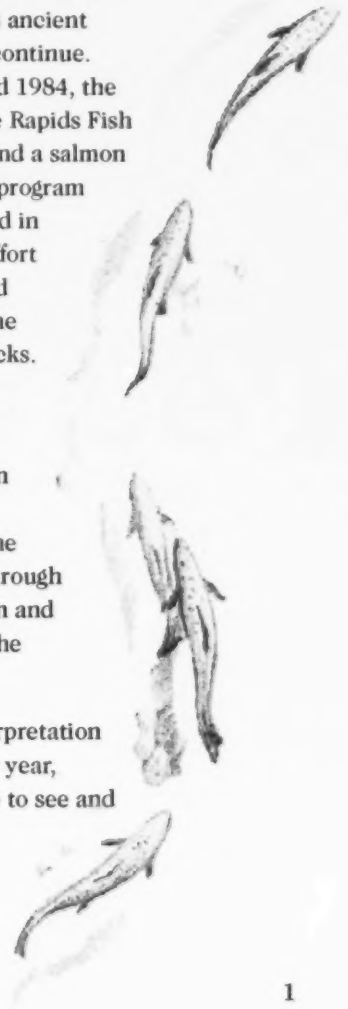
For thousands of years, salmon have travelled up the Yukon River to spawn in its many tributaries. Some travelled as far as the Yukon River's headwaters, near to where the Whitehorse Fishway is today. The salmon laid their eggs in the gravel. These eggs hatched and new salmon grew in the glacier-fed waters. The young salmon made their way back to the ocean, only to return in a few years to begin the cycle anew.

Thus the cycle continued, uninterrupted, until the late 1950s, when the Northern Canada Power Commission built the Whitehorse Rapids Hydroelectric Facility (the dam) to meet the electricity needs of a growing community. In 1959, the Whitehorse Fishway was built to help this ancient migration continue. In 1983 and 1984, the Whitehorse Rapids Fish Hatchery and a salmon transplant program were started in a further effort to build and maintain the salmon stocks.



The Yukon Energy Corporation took over the ownership of the fishway and hatchery in 1987. At the interpretation centre in the fishway, you can view fish through the underwater window and learn more about the salmon and other fish species from displays inside the building and the viewing platforms above the Yukon River.

The Yukon Fish and Game Association operates the interpretation programs at the centre on behalf of Yukon Energy. Every year, between June 1 and August 31, over 35,000 people come to see and learn about the fishway. We hope you are among them!



Want to hear a fish story?

Long distance travellers. The salmon that hatch in the streams near Whitehorse travel over 3,000 kilometres to the ocean. "No big deal," you say, "it's all downstream." True, but later in life, they make the same trip back upstream.

Incredible navigators. Four to six years after leaving the creeks where they hatched from eggs, Chinook salmon travel all the way from the ocean, returning to spawn in the stream where they were born.

Talk about your crash diet! For the three months it takes salmon to swim from the Pacific Ocean to Whitehorse, they don't eat anything, relying instead on stored body fats for energy.

Climbers extraordinaire. After their 3,000-kilometre swim upstream, Chinook climb the 366-metre-long fish ladder, believed to be the longest wooden fish ladder in the world.

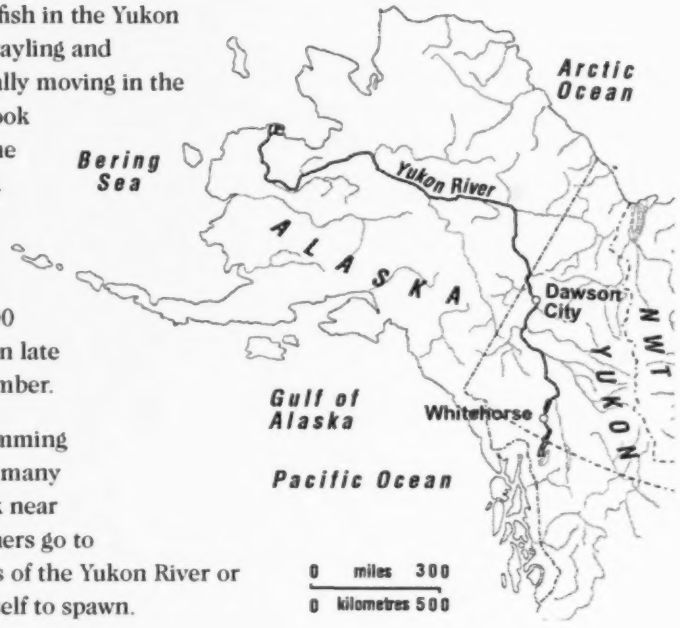
It's no *eggs*-ageration. Chinook salmon lay an average of 5,000 eggs when they spawn. Of these, only about 10 percent will make it to the fry, or juvenile fish, stage.

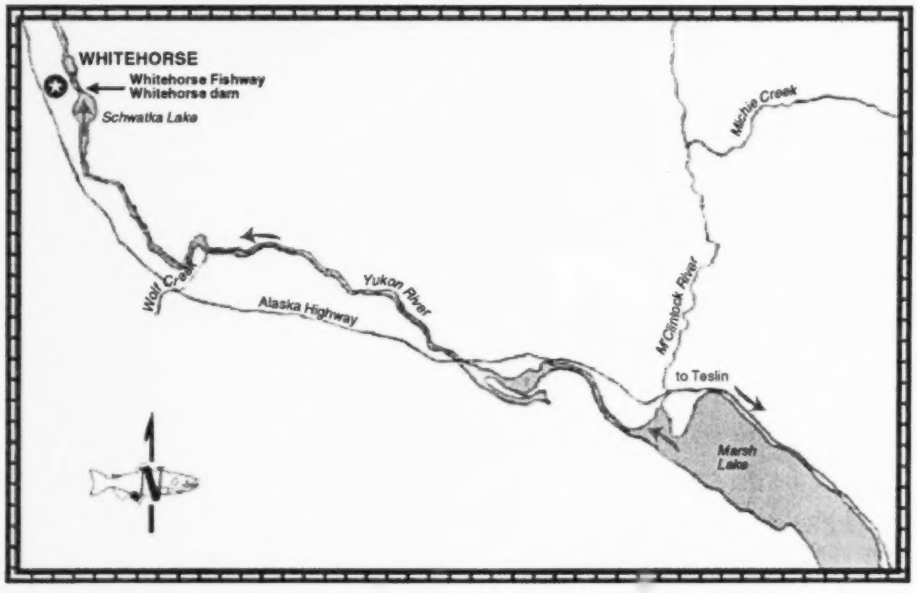
And then what? The Chinook salmon die shortly after spawning. A sad ending to a heroic tale. Mind you, the dead salmon become food for many animals and birds, including bears and eagles.

Where do the fish come from?

Many fresh water fish in the Yukon River, such as grayling and inconnu, are continually moving in the river. The adult Chinook salmon, however, come here only once a year. After leaving the Bering Sea in May or June, they swim up the Yukon River (3,000 kilometres), arriving in late July until early September.

For those salmon swimming upstream of the dam, many head for Michie Creek near Marsh Lake, while others go to the smaller tributaries of the Yukon River or remain in the river itself to spawn.





First Nations and the salmon

At the end of the last ice age, some 10,000 or 11,000 years ago, the great glaciers melted and the Yukon River linked up with the Pacific Ocean via the Bering Sea. It took thousands of years for the glaciers to melt and many more centuries for the melt water to be clear of glacial silts. Once the silts settled and the water was clear, salmon began to migrate up the river.

Until that time, the people in this area had been hunters. They may have originally come here following the herds of caribou across the Bering land bridge to the ice-free area of the northern Yukon and Alaska, known as *Beringia*. As the ice receded, vast grasslands opened up, drawing the grazing animals further to the south.

Primarily hunters, there is no archaeological evidence that the early people of the Yukon did much fishing until about 5,000 years ago. When the salmon began to run in the rivers, however, the people soon became very proficient fisher folk, making the annual migration of salmon part of their yearly harvesting routine.

Catching the fish

The methods of catching the salmon varied. The simplest approach was to spear or gaff the fish where they stopped to rest in eddies (slower water near the river bank) or behind rocks. Later, nets were used with sinkers and floats attached to keep them in place in the current. This was much more efficient as the people only had to check them a few times a day.

Various types of traps were also designed. In shallower water, the people sometimes constructed fences of sticks to funnel the fish into a narrow compound where they would be trapped. Sometimes, the fences would funnel the fish into woven baskets that would let the fish in, but leave no room for them to turn around and escape.

The trap illustrated on the next page is a type used on shallow streams and rivers. The rails of the fencing allowed the water through but not the fish. The fish followed the fence to a narrow opening where they entered the prow. At this point they turned around to head downstream and enter the trap. Sharpened stakes prevented them from leaping out. The mechanics of these traps were much like today's fishway, except, of course, for the sharpened stakes.

After an ample catch, the people would lift up parts of the fences or remove some of the basket traps to allow some fish to escape. This ensured there would be plenty of fish to spawn and maintain the stocks.

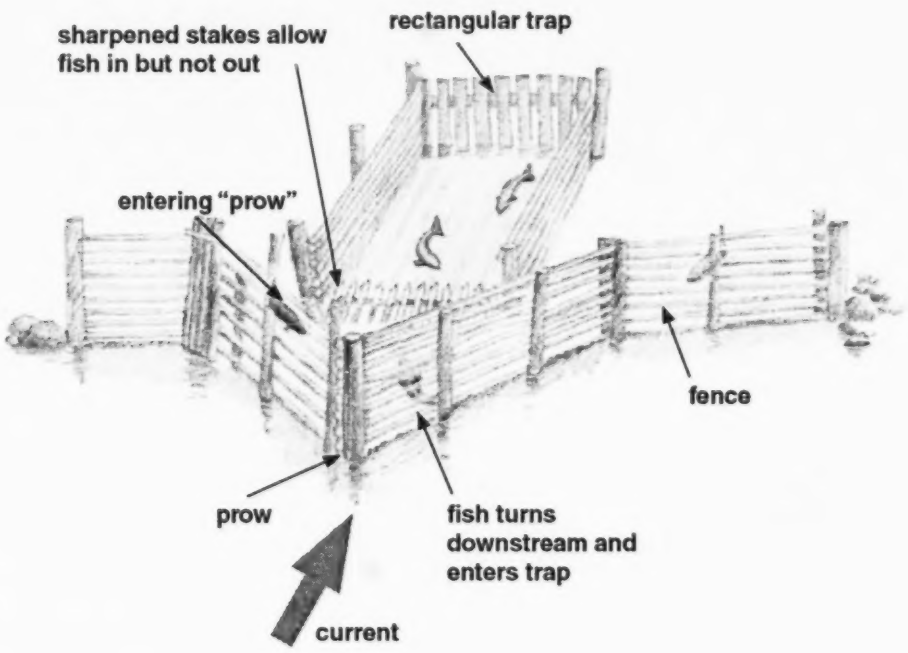
Much later, fish wheels were used. This device consisted of large buckets mounted on a wheel, which floated on a raft. The river current would turn the wheel, scoop up fish, and dump them into a holding basket.

Preserving the fish

In order to provide people with enough food to last them through a long Yukon winter, fish were preserved by drying. The fish were split and laid open, or cut into strips and hung on a wooden rack over a smoky fire. The smoke dried the fish and acted as a natural preservative. This is still a popular method for preserving fish today.

Today

The First Nations' relationship with salmon has been forged over thousands of years. The annual Chinook salmon run still provides food for the aboriginal people of the Yukon. The federal government relies on the traditional knowledge of native elders to help manage the fish stocks.



Building the dam and fishway

In the mid-1950s, the Yukon underwent many changes. The Alaska Highway, built during World War II, and the Klondike Highway now linked many Yukon communities by road. The sternwheelers, which had operated for half a century between Whitehorse and Dawson on the Yukon River, soon became obsolete. The capital of the Yukon moved from Dawson to Whitehorse, contributing to the rapid growth around Whitehorse.

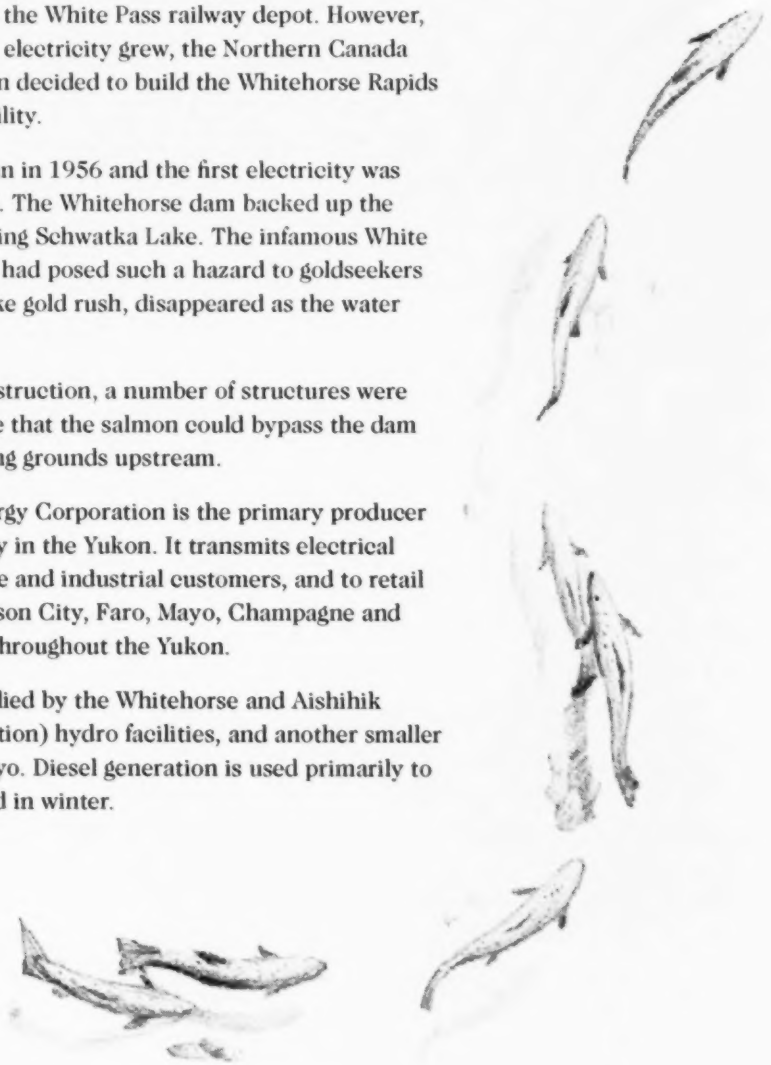
At that time, The Yukon Electrical Company provided the city with electricity from a diesel generator located downtown, beside the White Pass railway depot. However, as the demand for electricity grew, the Northern Canada Power Commission decided to build the Whitehorse Rapids Hydroelectric Facility.

Construction began in 1956 and the first electricity was generated in 1958. The Whitehorse dam backed up the Yukon River, forming Schwatka Lake. The infamous White Horse Rapids that had posed such a hazard to goldseekers during the Klondike gold rush, disappeared as the water level rose.

At the time of construction, a number of structures were designed to ensure that the salmon could bypass the dam and reach spawning grounds upstream.

Today, Yukon Energy Corporation is the primary producer of electrical energy in the Yukon. It transmits electrical power to wholesale and industrial customers, and to retail customers in Dawson City, Faro, Mayo, Champagne and other rural areas throughout the Yukon.

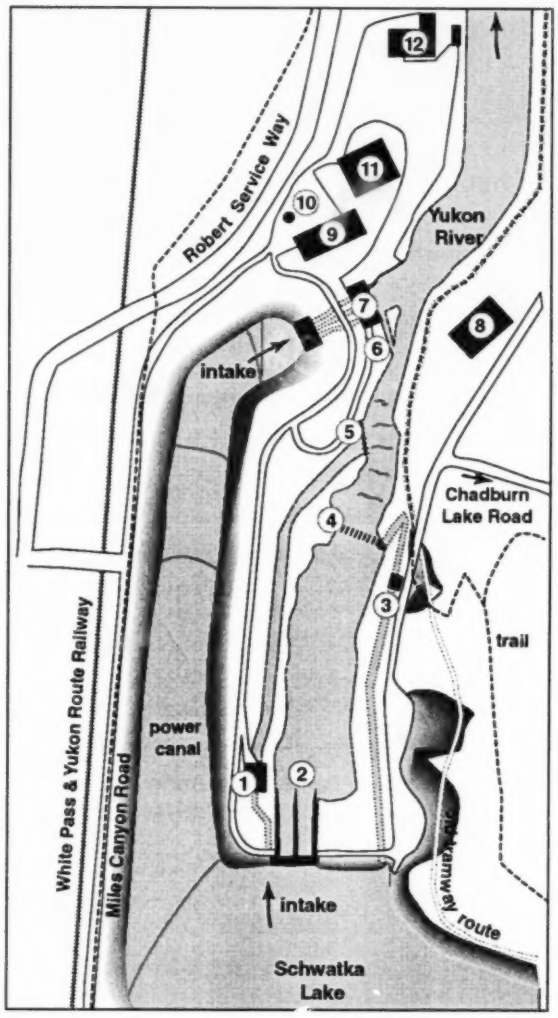
Electricity is supplied by the Whitehorse and Aishihik (near Haines Junction) hydro facilities, and another smaller hydro plant in Mayo. Diesel generation is used primarily to meet peak demand in winter.



Energy at the Whitehorse plant is generated by four turbines①⑦ and seven diesel generators⑨ which are supplied from a large diesel storage tank⑩. In the summer and fall, excess water passes through the spillway②.

The new administration and technical services building⑫ won a national energy efficiency design award. It replaced facilities destroyed by a fire on October 30, 1997.

Power from the site is joined, via the Whitehorse Rapids substation⑪, to the WAF (Whitehorse/Aishihik/Faro) power grid at the Riverdale switching station⑧. The two wind turbines on top of Haeckel Hill, visible to the northwest, are also part of the WAF system.



Whitehorse Rapids Hydroelectric Facility

The Whitehorse Fishway③ contains the underwater viewing windows, as well as the outside viewing platforms and the fish ladder.

Other structures that aid in fish migration include the fish barrier dam④, fish screens across the entrance to the tailrace channel⑤ (installed prior to the arrival of the Chinook each summer, then removed once the migration is complete), and an underwater diversion channel⑥ to redirect fish back into the main stream of the river.

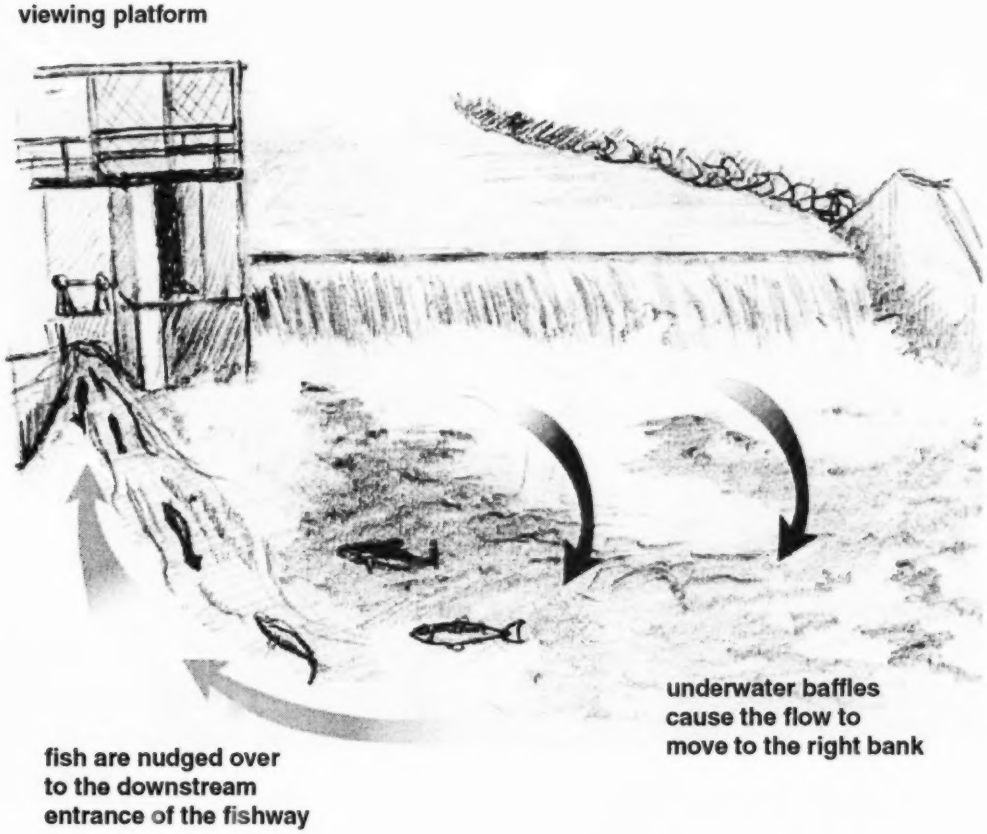
How the fish get past the dam

The barrier dam is the low concrete structure that spans the river, preventing fish from swimming up into the turbulent water below the spillway. The concrete wall angles upstream to direct fish to the downstream entrance to the fishway.

The entry at the bottom of the fish ladder offers a good resting place. Water flow in the fishway can be adjusted by valves in the lower ladder to attract the fish into the fishway.

The ladder is built in a series of steps. It is approximately 366 metres long and rises over 15 metres. Each step has a vertical baffle that the fish can jump over or they can swim through a submerged opening.

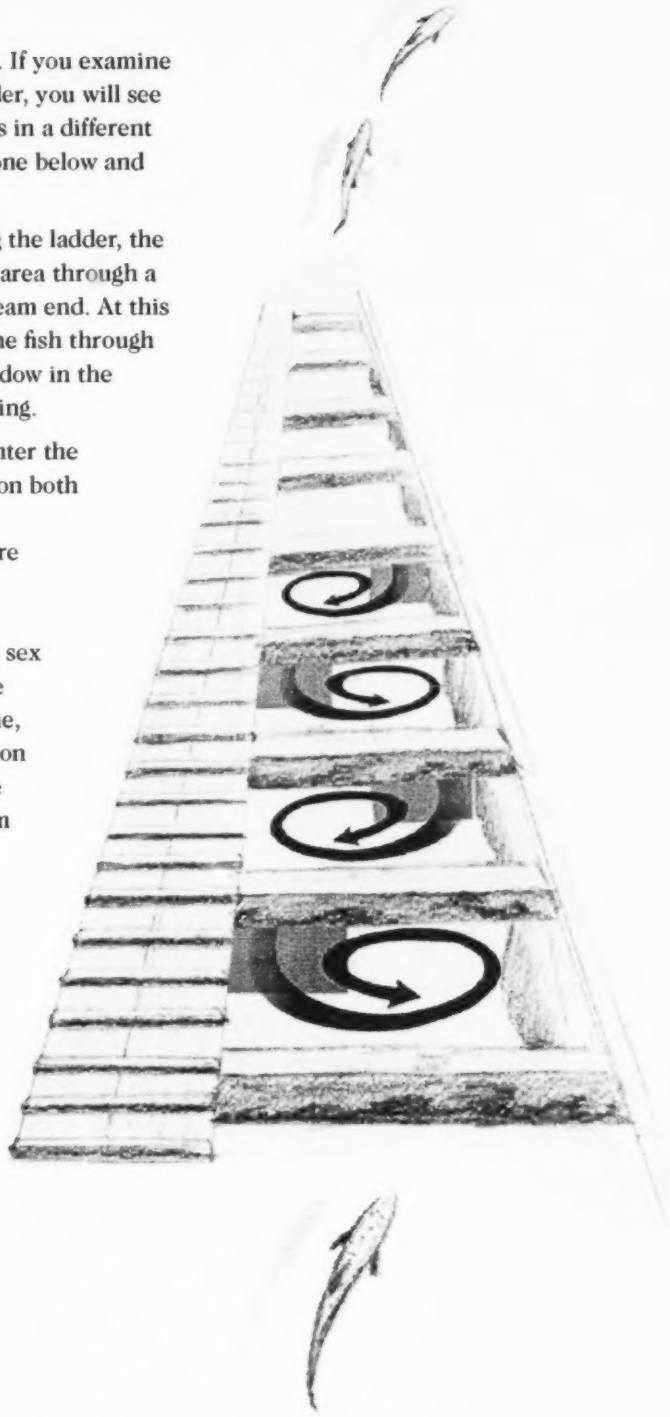
The flow of water through each section creates a series of eddies, allowing the fish to rest between each step, while providing enough flow to encourage the fish to


viewing platform
underwater baffles cause the flow to move to the right bank
fish are nudged over to the downstream entrance of the fishway

continue swimming. If you examine a section of the ladder, you will see that each eddy spins in a different direction from the one below and above.

About halfway along the ladder, the fish enter a holding area through a gate at the downstream end. At this point you can see the fish through the observation window in the interpretation building.

When the salmon enter the holding tank, gates on both the upstream and downstream sides are closed temporarily while staff observe and record the size, sex and condition of the fish. Also at this time, some Chinook salmon are collected for the brood stock program at the Whitehorse Rapids Fish Hatchery.



The fish ladder

The fish hatchery

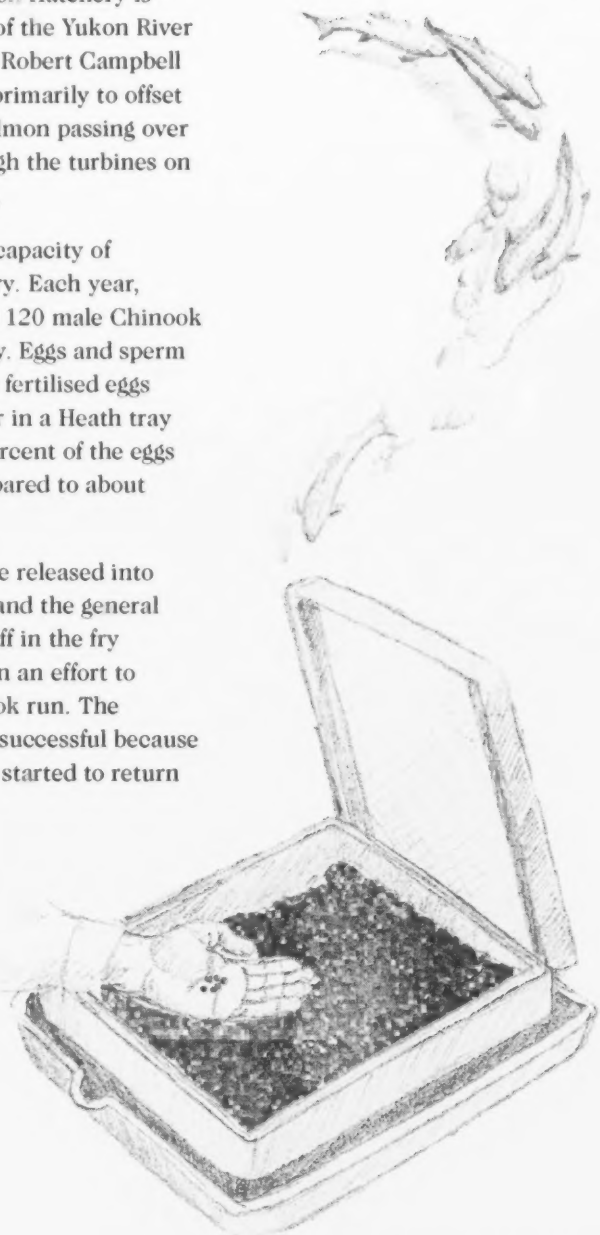
The Whitehorse Rapids Fish Hatchery is located on the east side of the Yukon River between the fishway and the Robert Campbell Bridge. It was built in 1983, primarily to offset losses of juvenile Chinook salmon passing over the dam's spillway and through the turbines on their ocean-bound migration.

The hatchery has an annual capacity of 250,000 to 300,000 salmon fry. Each year, approximately 60 female and 120 male Chinook are removed from the fishway. Eggs and sperm are collected and mixed. The fertilised eggs are incubated over the winter in a Heath tray system. Approximately 80 percent of the eggs survive to the fry stage, compared to about 10 percent in the wild.

Annually, the hatchery fry are released into Wolf Creek. School children and the general public assist the hatchery staff in the fry release. This has been done in an effort to support the dwindling Chinook run. The program seems to have been successful because hatchery-raised salmon have started to return to Wolf Creek.

The hatchery also raises other species of freshwater fish for stocking local pothole lakes. These include kokanee, bull trout, lake trout and arctic char.

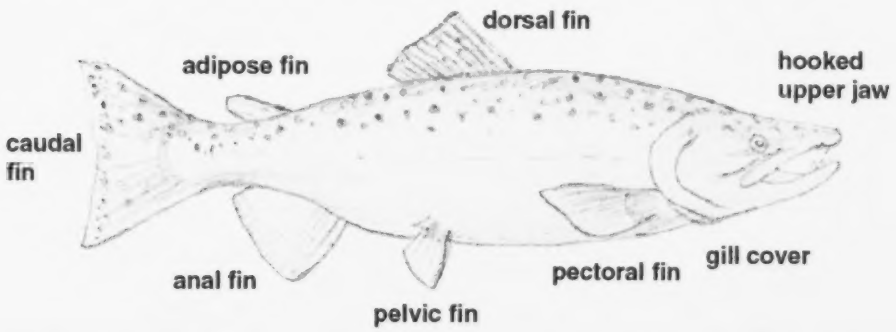
Sorry, but the hatchery is not open to the public.



Heath tray with salmon eggs.

Our featured fish: The Chinook salmon

The Latin name for this king of fish is *oncorhynchus tshawytacha*. The name comes from the Greek words *onkos* (hook) and *rynchos* (nose). *Tshawytscha* is the common name for the species among certain groups of the Alaska First Nations people. In non-scientific language, this fish is known as the Spring, King or, when over 14 kilograms, as a Tyee. Its Southern Tutchone name is *Gyü*



When it is in the ocean, the Chinook is blue-green on the back with silvery sides and a white underbelly. The top half of the back, including the dorsal fin and both the upper and lower part of the caudal fin, are heavily marked with irregular black spots.

When they are ready to spawn, the Chinook instinctively head back up the river of their birth. At this point, they stop eating and start to develop the physical characteristics of spawning salmon, including the males' "hooked" jaw that gives them their name. The salmon's back becomes dark, with the sides being pink to dark reddish in colour. Adult fish average seven to nine kilograms, but fish of 30 kilograms have been caught in the Yukon River.

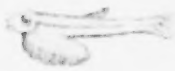
The egg

The Chinook salmon egg is bright orange to pink, approximately the size of the circle below.

The female Chinook lays several thousand eggs. Many eggs will not survive due to the harsh winter incubation environment or because they are eaten by other fish.

Alevin

This is the stage when the fish has just hatched from the egg. Alevins carry around part of the egg sac to provide them with nourishment for the first part of their lives. At this stage, they are less than 2.5 centimetres long.



Many alevins will not survive to emerge from the gravel where the eggs were laid. They may freeze as the water temperatures drop or die from lack of oxygen in the water.

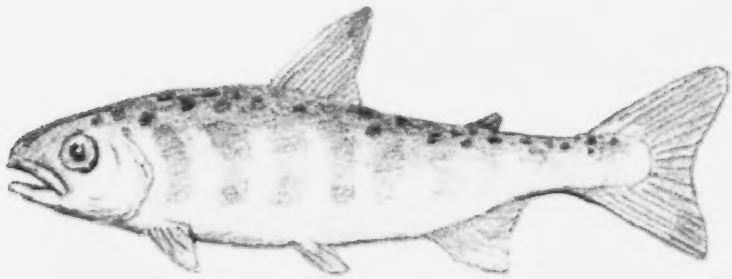
Fry

At this stage, the salmon are not very big: approximately 3.5 centimetres long upon emerging from the gravel and between 6.0 and 8.5 centimetres long at the end of the summer. However, the young are able to feed on their own, favouring aquatic insects.

At the fry stage, fish are released into Wolf Creek and Michie Creek. Wish them luck! They'll need it to grow and to evade pike, inconnu, burbot, kingfishers, gulls, mink and other predators. Unfortunately, many fry will not survive the first summer.

Smolt

Now a little bit bigger (up to 12 centimetres), smolt are salmon at about a year to 18 months old.



Usually, young salmon spend their first year in the stream where they were born or move downstream to larger rivers. Yukon River Chinook are unique as many or most of the wild fry will migrate upstream into non-spawning (non-natal) streams to grow. A large proportion of the juveniles will spend their first winter there. The following spring, they will migrate to the ocean. Most of these salmon will return to spawn anytime between three to six years of age.

Adults return

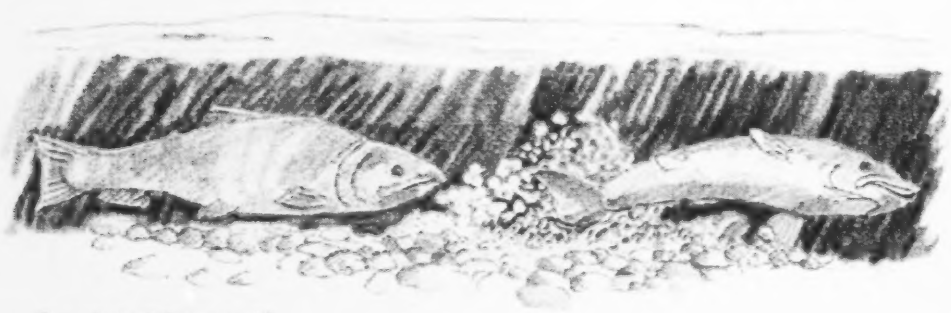
Fully grown Chinook salmon range from Kotzebue Sound, Alaska to Santa Barbara, California. When it comes time to spawn, they navigate their way back to the stream where they were hatched. Scientists are not certain how they manage this but many think the salmon can sense a certain chemical signature from the waters of their birth.

Although many salmon spawn in rivers and streams, the Chinook salmon require deeper water and larger gravel than other types of salmon. For this reason, Chinook spawn in the Yukon River as well as its smaller tributary streams.

Females dig nests *(redds)* by turning over on their sides and flapping their tails up and down in the gravel. Males fight over the female and the right to fertilize her eggs. The female deposits her eggs in the redd and the male covers the eggs with milt. Then the adult salmon, exhausted by the trip and spawning, die. The eggs are on their own.

All salmon eggs, and the newly hatched young, need a high level of oxygen and cool water to survive. This is when they are most susceptible to changes in habitat caused by siltation, high water temperatures, low oxygen conditions, loss of vegetation near streams, pollution and reductions in river flow. Often these are natural occurrences, but they can be caused by human activities that alter the river environment.

The number of returning salmon is greatly influenced by the level of harvesting, both domestic and international, as well as the quality and quantity of habitat.



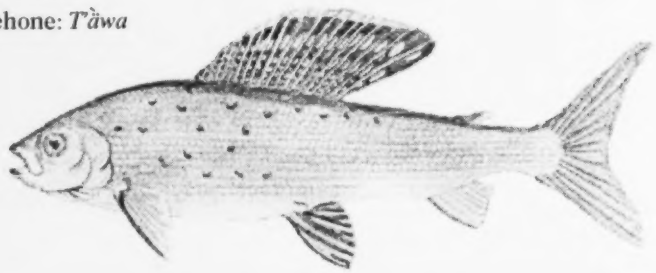
Female building a redd.

Other fish in our water

Grayling

Thymallus arcticus

Southern Tutchone: *T'àwa*

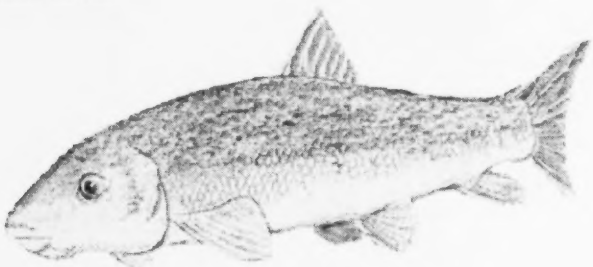


The grayling is named after the herb *thyme* because early anglers thought that is what this fish smelled like. Others felt its beautiful colours were a result of its feeding on gold. A truly Yukon fish! It is richly coloured with a showy, high dorsal fin. The body colours range from dusky gold through green to aquamarine. The grayling likes cold, fresh water and can be found in lakes and rivers in the Yukon. An average fish weighs about half a kilogram.

Longnose sucker

Catastomus catastomus

Southern Tutchone: *Tats'at*

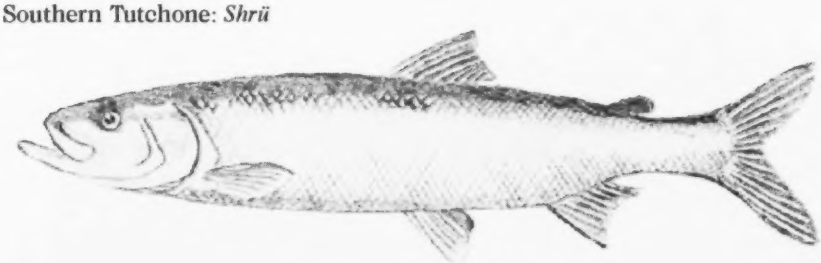


Bottom feeders. (Well, someone has to do it.) The long, tubular mouth of the sucker is adapted for cleaning up insects, snails, vegetation and just about anything else that is edible on the river bottom. Although they are found in the fast flowing waters near the fishway, suckers prefer the warm, shallow backwaters of rivers and lakes. Adults are dark grey to black on their back, with white underbellies. When in breeding colours, the male has dark bands along its back separated by bright red stripes.

Inconnu

Stenodus leucichthys

Southern Tutchone: *Shrü*



"What is the name of that fish?" "It is unknown." That is what *inconnu* means in French. It is also called *coney* or *sheefish*. Inconnu are light-coloured fish with a little bit of dusky colouring on their dorsal fins. They look a little different than other river fish because the lower jaw is longer than the upper jaw. They are fairly abundant in the lower Yukon River system, where they can reach 10 kilograms in weight. Inconnu are not that common this far upstream.

Pike

Esox lucius

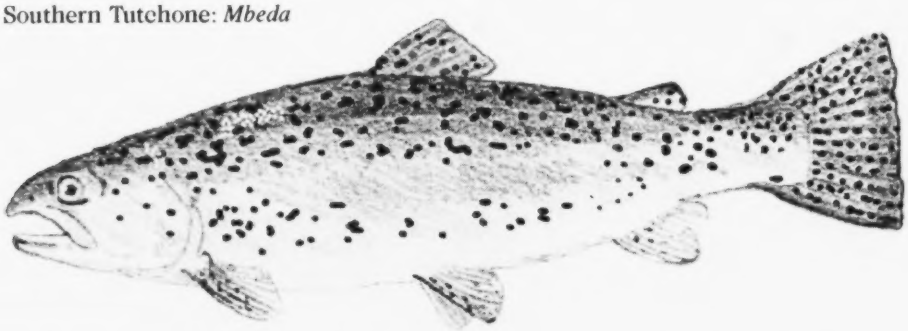
Southern Tutchone: *Tàłe*

The pike is renowned for its fearsome, toothy appearance. The green and white mottled back is ideal camouflage for lurking in weeds and shady places awaiting prey. The pike hangs motionless under cover until a victim ventures near, then, with incredible acceleration, snatches its unwary prey in strong jaws. Pike are generally found in the shallower, warmer backwaters of a river. They can tolerate warmer temperatures and lower oxygen levels than most northern fish.

Rainbow trout

Oncorhynchus mykiss

Southern Tutchone: *Mbeda*

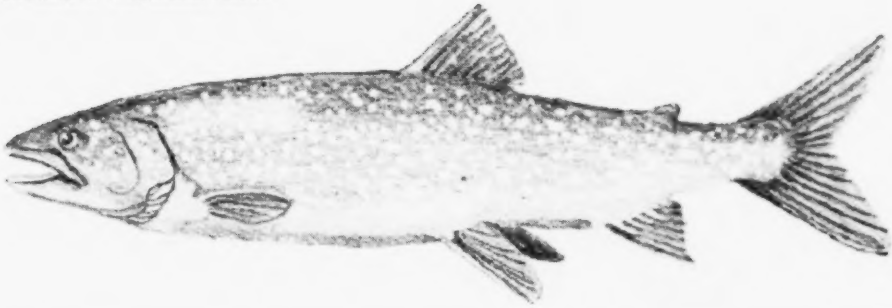


Because of its strong fighting ability, the rainbow trout is one of the most prized sport fish in the world. It is related to the salmon. The name comes from its brilliant colouration. Its back is usually dark green while its sides show bright red. The rainbow trout is not native to the Yukon River and was introduced into the McIntyre Creek drainage in the 1940s. It has since colonised a limited area around Whitehorse.

Lake trout

Christivomer namaycush

Southern Tutchone: *Mbet*

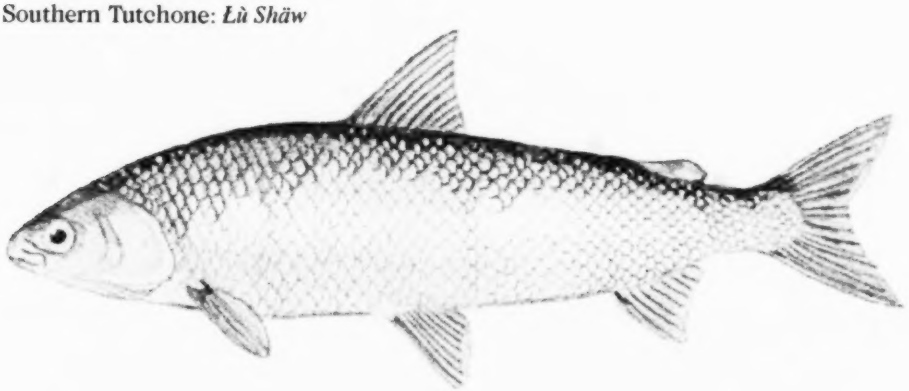


The Yukon is famous for the size of its lake trout. Fish 10 to 15 kilograms are not uncommon, though the biggest ones are found in lakes, not in rivers. Adult colouring varies from almost black through grayish to light green. The flesh can also range in colour from pale white to deep red. Much of this is dependent on diet. Lake trout, especially larger ones, mostly eat other fish. Smaller ones, however, eat insects and other aquatic organisms.

Broad whitefish

Coregonus nasus

Southern Tutchone: *Łù Shäw*



There are three types of whitefish in the Yukon — lake or humpback, broad whitefish and the round whitefish. The most notable in the Yukon River, however, is the broad whitefish. This fish tends to be larger than its relatives at 1.5 to 2.5 kilograms. Broad whitefish have flattened sides and compressed bodies, large adipose fins and deeply forked caudal fins. The head is short with a blunt snout. This snout shape is adapted to bottom feeding, enabling the whitefish to survive on insect larvae and snails.

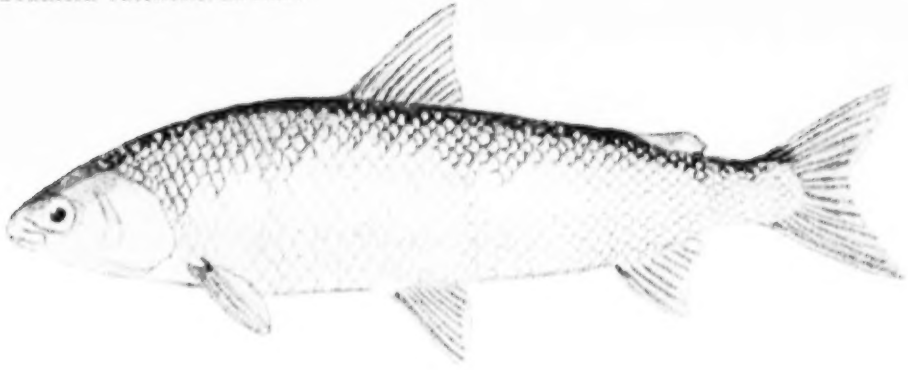
What are they eating?

While the diets of fish in the Yukon River vary, almost all depend on smaller fish and the aquatic insects that live in these waters. These smaller fish include the young of species like the salmon, but also include tiddlers, such as stickleback, chub, sculpin and minnows. Fish large and small feed on the aquatic insects in the river. Stonefly, mayfly, caddis and black fly are among the river's insect inhabitants. During most of the year, the insects live close to the bottom of the river among protective rocks or burrowed into the mud. They spend their egg, larval and pupal stages in the water but must come to the surface to emerge as adults. On warm summer evenings, you can often see clouds of the moth-like caddis flies coming off the waters. This emergence time is a feeding bonanza for the fish. In the quieter waters of the river, you can watch grayling gorging themselves on insects rising to the surface. These insects spend a relatively brief time as adults. Their main purpose is to mate. Once the female has mated, she returns to the water to lay eggs. This is another opportunity for the fish to catch the insects at their most vulnerable moment.

Broad whitefish

Coregonus nasus

Southern Tutchone: *Łù Shäw*



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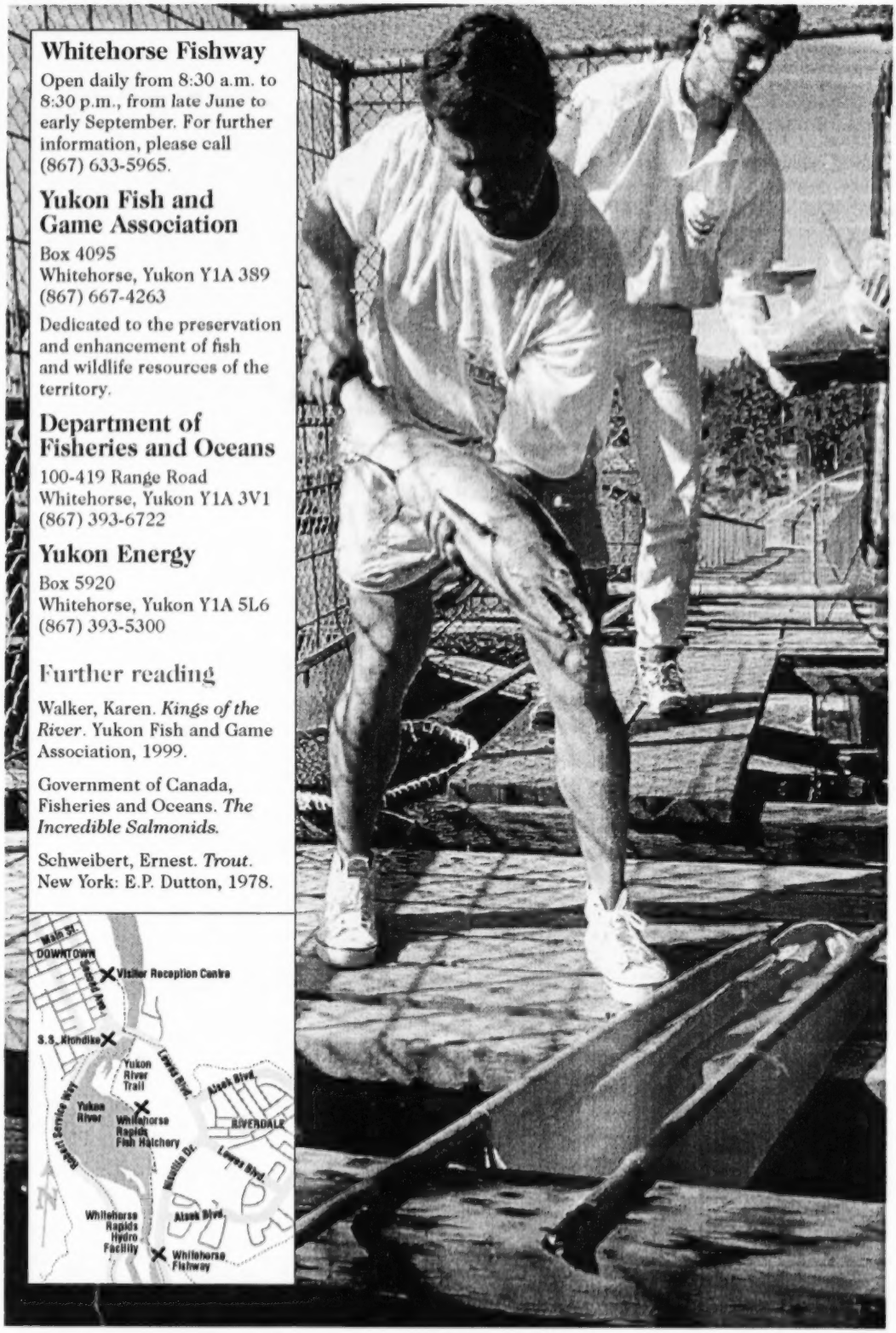

Whitehorse Fishway

Open daily from 8:30 a.m. to 8:30 p.m., from late June to early September. For further information, please call (867) 633-5965.

Yukon Fish and Game Association

Box 4095
Whitehorse, Yukon Y1A 3S9
(867) 667-4263

Dedicated to the preservation and enhancement of fish and wildlife resources of the territory.

Department of Fisheries and Oceans

100-419 Range Road
Whitehorse, Yukon Y1A 3V1
(867) 393-6722

Yukon Energy

Box 5920
Whitehorse, Yukon Y1A 5L6
(867) 393-5300

Further reading

Walker, Karen. *Kings of the River*. Yukon Fish and Game Association, 1999.

Government of Canada, Fisheries and Oceans. *The Incredible Salmonids.*

Schweibert, Ernest. *Trout*. New York: E.P. Dutton, 1978.